



UNIVERSITI PUTRA MALAYSIA

**EFFECTS OF LYCOPENE AND RED PALM OIL ON OXIDATIVE STRESS
IN STREPTOZOTOCIN-INDUCED DIABETIC RATS**

HANIEH JAFARI

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MASTER OF SCIENCE

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STREPTOZOTOCIN-INDUCED DIABETIC RATS**



Thesis submitted to the School of Graduate Studies, Universiti Putra Malaysia, in

Fulfilment of the Requirements for the Degree of Master of Science

December 2010

DEDICATION

**This thesis is dedicated to
My lovely husband and parents who supported me
all these years**



Abstract of thesis presented to the senate of Universiti Putra Malaysia in fulfilment of
the requirement for the degree of Master of Science

**EFFECTS OF LYCOPENE AND RED PALM OIL ON OXIDATIVE STRESS IN
STREPTOZOTOCIN-INDUCED DIABETIC RATS**

By

HANIEH JAFARI

December 2010

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Faculty: Medicine and Health Sciences

The purpose of the current study was to determine lycopene and red palm oil effects on oxidative stress in streptozotocin-induced diabetic rats. The studied parameters for oxidative stress are fasting blood glucose level, oxidative stress biomarkers (superoxide dismutase and glutathion peroxidase), lipid profiles (low-density lipoprotein cholesterol, triglycerides, total cholesterol and high-density lipoprotein cholesterol) and body weight.

For induction of diabetes, the rats were injected with 55 mg/kg body weight of STZ (Streptozotocin) dissolved in 0.05 M citrate buffer (pH4.5). Lycopene (10 and 20 mg/kg bw) and red palm oil (10 and 20 mg/kg bw) were given to the diabetic rats by force feeding for six weeks supplementation. The results indicated that there was significant difference in fasting blood glucose level after 6 weeks of lycopene (10 and 20 mg/kg

bw) and red palm oil (10 and 20 mg/kg bw) administration as compared to diabetic control group. The supplementation with red palm oil (10 and 20 mg/kg bw) significantly ($p < 0.05$) reduced the plasma low-density lipoprotein cholesterol, triglycerides and total cholesterol of diabetic rats as compared to control diabetic (untreated and super olein oil) animals. The administration with red palm oil 10 and 20 mg/kg bw, has increased the level of HDL-C in treated groups as compared to control diabetic rats. However, there were no significant changes in lipid profiles (low-density lipoprotein cholesterol, triglycerides, total cholesterol and high-density lipoprotein cholesterol) level in diabetic treated groups with lycopene (10 and 20 mg/kg bw) after six weeks supplementation. Superoxide dismutase and glutathion peroxidase activities were enhanced in diabetic treated groups with lycopene (10 and 20 mg/kg bw) and red palm oil (10 and 20 mg/kg bw) compared to that in control diabetic rats. The supplementation of lycopene (10 and 20 mg/kg bw) and red palm oil (10 and 20 mg/kg bw) significantly prevented body weight loss starting from 3rd week of lycopene and red palm oil administration in treated animals. These findings suggest that lycopene may have considerable therapeutic potential as an antioxidant but there was no significant lipid lowering effect in Type 2 diabetes mellitus.

These results also showed that red palm oil (RPO) lowered the blood glucose level and improved dyslipidemia. Level of oxidative stress markers were also reduced with administration of RPO. These findings indicate antidiabetic capability of red palm oil.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai
memenuhi keperluan untuk ijazah Master Sains

**KESAN LIKOPEN DAN MINYAK KELAPA SAWIT KE ATAS STRES
OKSIDATIF PADA TIKUS TERARUH STREPTOZOTOCIN**

Oleh

HANIEH JAFARI

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Pengerusi: Profesor Asmah Rahmat, PhD

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Tujuan kajian ini adalah untuk menentukan kesan likopen dan minyak kelapa sawit ke atas stres oksidatif pada tikus teraruh streptozotocin. Parameter yang dikaji dalam kajian ini adalah paras gula dalam darah, enzim stres oksidatif (superoxide dismutase dan glutathion peroksida), profil lipid (jumlah kolesterol, trigliserida, HDL-kolesterol, LDL-kolesterol) dan berat badan. Bagi pengaruhan diabetes ke atas tikus, 55 mg/ kg berat badan streptozotocin (STZ) telah dilarutkan dalam 0.05 M bufer citrate (pH4.5) dan disuntik pada tikus. Likopen (10 and 20 mg/kg berat badan) dan minyak kelapa sawit (10 and 20 mg/kg berat badan) diberikan pada tikus diabetes teraruh streptozotocin secara paksa selama 6 minggu rawatan suplemen.

Hasil kajian menunjukkan terdapat perbezaan yang signifikan dalam paras gula dalam

darah tikus teraruh diabetes selepas 6 minggu pengambilan likopen dan minyak kelapa sawit bagi kedua-dua dos apabila dibandingkan dengan kumpulan kawalan. Rawatan suplemen dengan minyak kelapa sawit (10 and 20 mg/kg berat badan) menurunkan dengan signifikan ($p<0.05$) plasma LDL-kolesterol, trigliserida dan jumlah kolesterol tikus teraruh diabetes apabila dibandingkan dengan kumpulan kawalan diabetes. Pengambilan minyak kelapa sawit (10 and 20 mg/kg berat badan) meningkatkan paras HDL-kolesterol dalam kumpulan rawatan suplemen jika dibandingkan dengan kumpulan kawalan diabetes. Walaubagaimanapun, tiada perubahan yang signifikan dalam profil lipid (jumlah kolesterol, trigliserida, HDL-kolesterol, LDL-kolesterol) tikus yang diberikan suplemen likopen (10 and 20 mg/kg berat badan) selepas 6 minggu tempoh rawatan suplemen. Aktiviti superoxide dismutase dan glutathion peroksid adalah lebih baik dalam kumpulan diabetes yang diberi suplemen likopen dan minyak kelapa sawit pada kedua-dua dos apabila dibandingkan dengan kumpulan kawalan diabetes. Pengambilan suplemen likopen dan minyak kelapa sawit pada kedua-dua dos secara signifikan menghalang penurunan berat badan bermula pada minggu ketiga rawatan suplemen.

Hasil kajian ini menunjukkan bahawa likopen berupaya memberikan potensi terapeutik sebagai antioksidan tetapi tiada kesan penurunan lipid yang signifikan terhadap diabetes mellitus jenis 2. Kajian ini juga menunjukkan minyak kelapa sawit berupaya menurunkan paras gula dalam badan dan menambahbaik dislipidemia. Tahap stres oksidatif juga menurun dengan pengambilan minyak kelapa sawit. Oleh itu, penemuan ini menunjukkan potensi minyak kelapa sawit sebagai antidiabetik.

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I certify that an Examination Committee met onto conduct the final examination of Hanieh Jafari on her Master degree thesis entitled "Effects of lycopene and red palm oil on oxidative stress in streptozotocin-induced diabetic rats" in accordance with "Universiti Pertanian Malaysia" (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at other institutions.

HANIEH JAFARI

Date: 29 December 2010



TABLE OF CONTENTS

	Page	
DEDICATION	ii	
ABSTRACT	iii	
ABSTRAK	v	
ACKNOWLEDGEMENTS	vii	
APPROVAL	viii	
DECLARATION	x	
LIST OF TABLES	xiv	
LIST OF FIGURES	xvi	
LIST OF ABBREVIATIONS	xvii	
CHAPTER		
1	INTRODUCTION	
1.1	Background of Study	1
1.2	Statement of the Problem	6
1.3	Objectives	10
1.3.1	General Objective	10
1.3.2	Specific Objectives	10
2	LITERATURE REVIEW	
2.1	Diabetes Mellitus	11
2.1.1	Classification	11
2.1.2	Pathophysiology of Type 2 Diabetes	12
2.1.3	Diagnosis	14
2.1.4	Complications	14
2.1.5	Prevalence of Diabetes in the World	16
2.1.6	Diabetes in Malaysia and it's Prevalence	18
2.1.7	Risk factors of Diabetes and its Complications	19
2.1.8	Lipid Profiles in Diabetes	21
2.2	Oxidative Stress	22
2.2.1	Free radical	24
2.2.2	ROS and Oxidative Stress	24
2.2.3	Oxidative Stress and Diabetes	25
2.2.4	Indicators of Oxidative Stress	27
2.2.5	Glutathione Peroxidase (GPx)	27
2.2.6	Superoxide Dismutase (SOD)	28
2.2.7	Antioxidant	30
2.3	Lycopene	31

2.3.1	Sources of Lycopene and it's Absorption	32
2.3.2	Role of Lycopene in Human Health	33
2.3.3	Lycopene and Antioxidant Capacity	33
2.3.4	Lycopene and Oxidative Stress	34
2.3.5	Effect of Lycopene on LDL Oxidation	36
2.3.6	Effect of Lycopene on DNA Oxidation	39
2.3.7	Lycopene and Oxidative Stress in Cancer and Heart Disease (CHD)	40
2.3.8	Lycopene and Diabetes	42
2.4	Red palm oil	46
2.4.1	Red palm oil and Oxidation	47
2.4.2	Protective effect of Red palm oil in Diseases related to Oxidative Stress	49
2.4.3	Red palm oil and Lipid Profiles	51
2.4.4	Red palm oil, Vitamin A	53
2.4.5	Red palm oil, Vitamin E	55
2.4.6	Palm oil and Cancer Prevention	58

3

MATERIALS AND METHODS

3.1	Chemicals	59
3.2	Animal Study	59
3.3	Induction of Diabetes	62
3.4	Lycopene and Red palm oil Supplementation	62
3.5	Blood Collection	62
3.6	Biochemical Analysis	63
3.6.1	Determination of Plasma Lipid Profiles	63
3.6.1.1	TC	64
3.6.1.2	LDL-C	64
3.6.1.3	HDL-C	65
3.6.1.4	TG	65
3.6.2	Determination of Superoxide Dismutase Activity (SOD)	66
3.6.3	Determination of Glutathione Peroxidase Activity (GPx)	69
3.6.4	Determination of Glucose level	70
3.7	Statistical Analysis	71

4

RESULTS

4.1	Induction of Experimental Diabetes Rats	72
4.2	Effects of Lycopene and Red palm oil on Body Weight	74
4.3	Effects of Lycopene and Red palm oil on Glucose level	76
4.4	Effects of Lycopene and Red palm oil on Lipid Profiles	79
4.4.1	Low-Density Lipoprotein Cholesterol	79
4.4.2	Triglycerides	82
4.4.3	Total Cholesterol	84

	4.4.4	High-Density Lipoprotein Cholesterol	87
4.5	Effects of Lycopene and Red palm oil on Superoxide Dismutase (SOD)	90	
4.6	Effects of Lycopene and Red palm oil on Glutathione Peroxidase (GPx)	93	
5	DISCUSSION		
5.1	Induction of Experimental Diabetes Rats	96	
5.2	Effects of Lycopene and Red palm oil on Body Weight	98	
5.3	Effects of Lycopene and Red palm oil on Glucose level	100	
5.4	Effects of Lycopene and Red palm oil on Lipid Profiles	102	
5.5	Effects of Lycopene and Red palm oil on SOD and GPx levels	106	
6	CONCLUSION AND RECOMMENDATIONS		
6.1	Conclusion	114	
6.2	Recommendations	118	
REFERENCES		120	
APPENDICES		138	
BIODATA OF STUDENT		146	